CSE3001-Software Engineering

in

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VIT®

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

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CARDINTATION

1. INTRODUCTION

1.1 Problem Statement

A doctor writes a prescription for you, but you aren't able to understand it? Or you wake up in the middle of the night with pain near the chest, do you immediately take medicine for heart ? It might've just been a gastric pain? These problems are some common scenarios in medical field that we face in day to day life.

This is where Doctor ASSISTANCE **program comes in.**

1.2. Background Study

According to non-profit organization Medscape India, which spearheads a campaign to address the issue, the number of fatal incidents due to unreadable prescriptions is internationally on the rise. In fact, the Institute of Medicine (IOM) reported that the sloppy handwriting of physicians is responsible for 7,000 deaths each year.(https://www.emirates247.com/news/emirates/death-by-prescription-doctors-handwriting-causes-7-000-deaths-a-year-2012-11-04-1.481418).

According to the WHO, only errors related to erroneous medicine prescriptions cost healthcare systems around the world some $42 billion .(https://www.indiatoday.in/world/story/medical-mistakes-cause-2-6-million-deaths-yearly-who-1599019-2019-09-14).

Self-diagnosis is prone to error and may be potentially dangerous if inappropriate decisions are made on the basis of a misdiagnosis.[1] Because of the risks, self-diagnosis is officially discouraged by governments,[1] physicians, and patient care organizations. Even physicians are discouraged from engaging in self-diagnosis,[2] because doctors also make mistakes in diagnosing themselves.[3] If the self-diagnosis is wrong, then the misdiagnosis can result in improper health care, including wrong treatments and lack of care for serious conditions.(https://en.wikipedia.org/wiki/Self-diagnosis).

1.3 Novel Idea

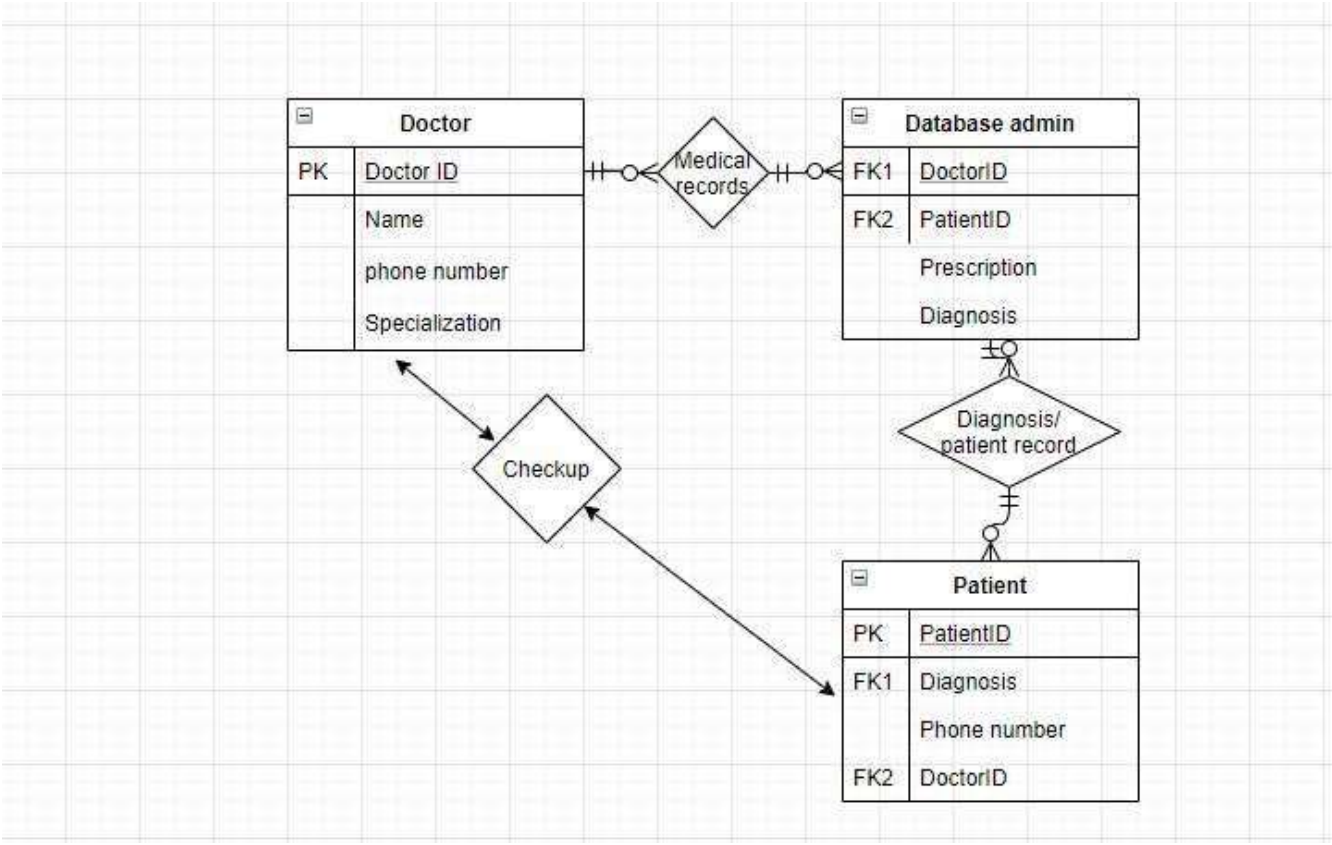
In order to satisfy the issues of both the sides, the doctor and the patient, we need an well functioning, easy and interactive interface that not only encompasses modern interactive methods like chatbot, but also smart predictive technology like Machine learning for our Self diagnosis program for the patient so that people don't misdiagnose and further aggravate their condition. Further a connection would be established via this program that helps sends the doctor a notification alerting about a person' diagnosis.

We also intend to completely eradicate the usage of paper in medicine, by making the entire process of maintaining records and writing prescriptions online. Hospitals are one of the biggest users of paper, something that is obtained after cutting down millions of trees. We also intend to safeguard the user's information by using hashing for password protection.

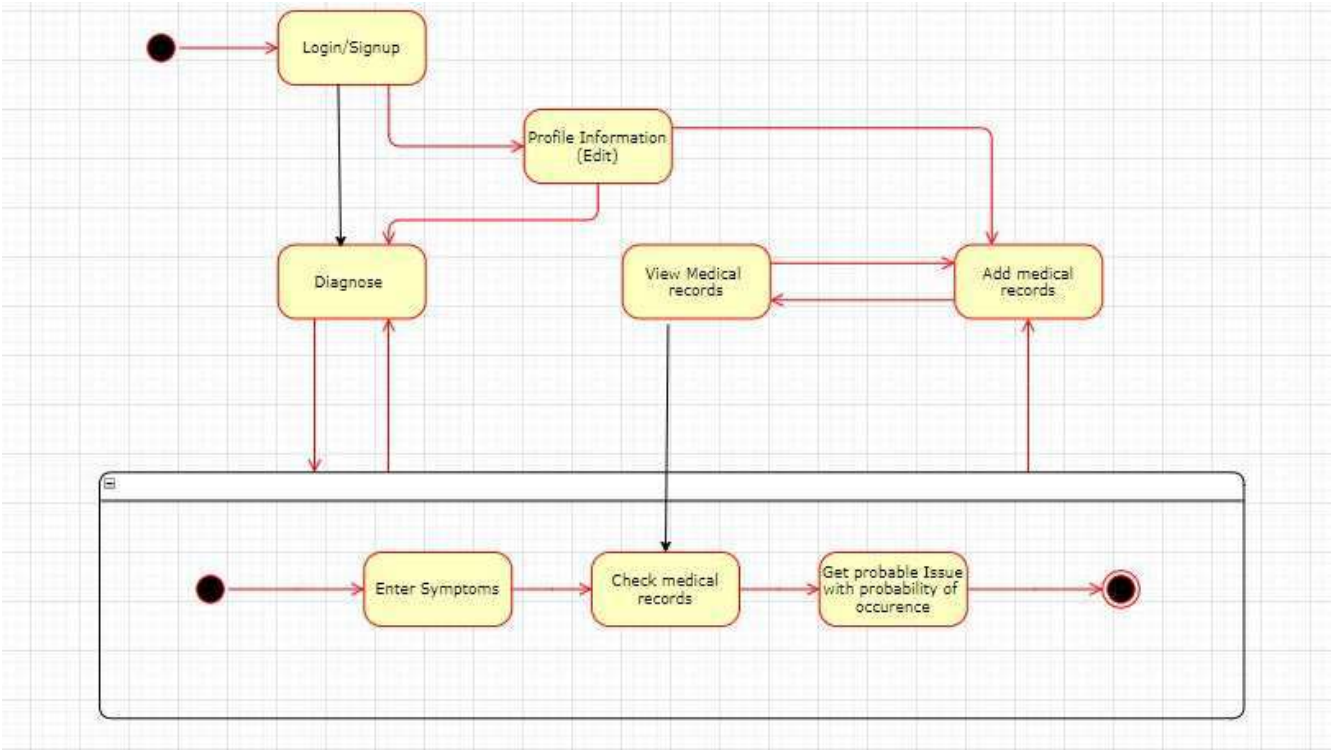
As for the process model, we chose the incremental model for software development as we have the projects requirements clear, we have 4 modules to work on which are The Login and signup module which also has the overall GUI for the software, Doctor's side(chatbot module to assist his tasks), the

patient record module(which stores the past medical records) and the medicine prediction module to help oblivious patients and alert doctor. Moreover, all these options are independent of each other and I can prioritize the requirements (increments) to be delivered orderly. And in each increment, we go with waterfall model because every requirement is clear in each increment (which is mentioned above). Also customer would not want to wait for completing the project.

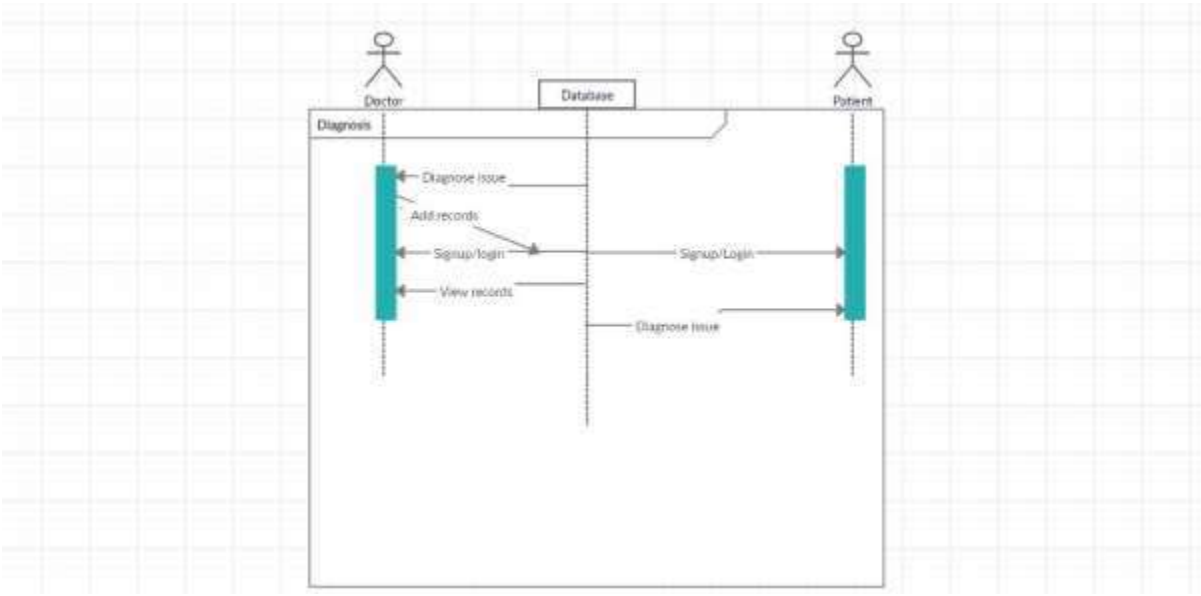
2. ANALYSIS MODELS



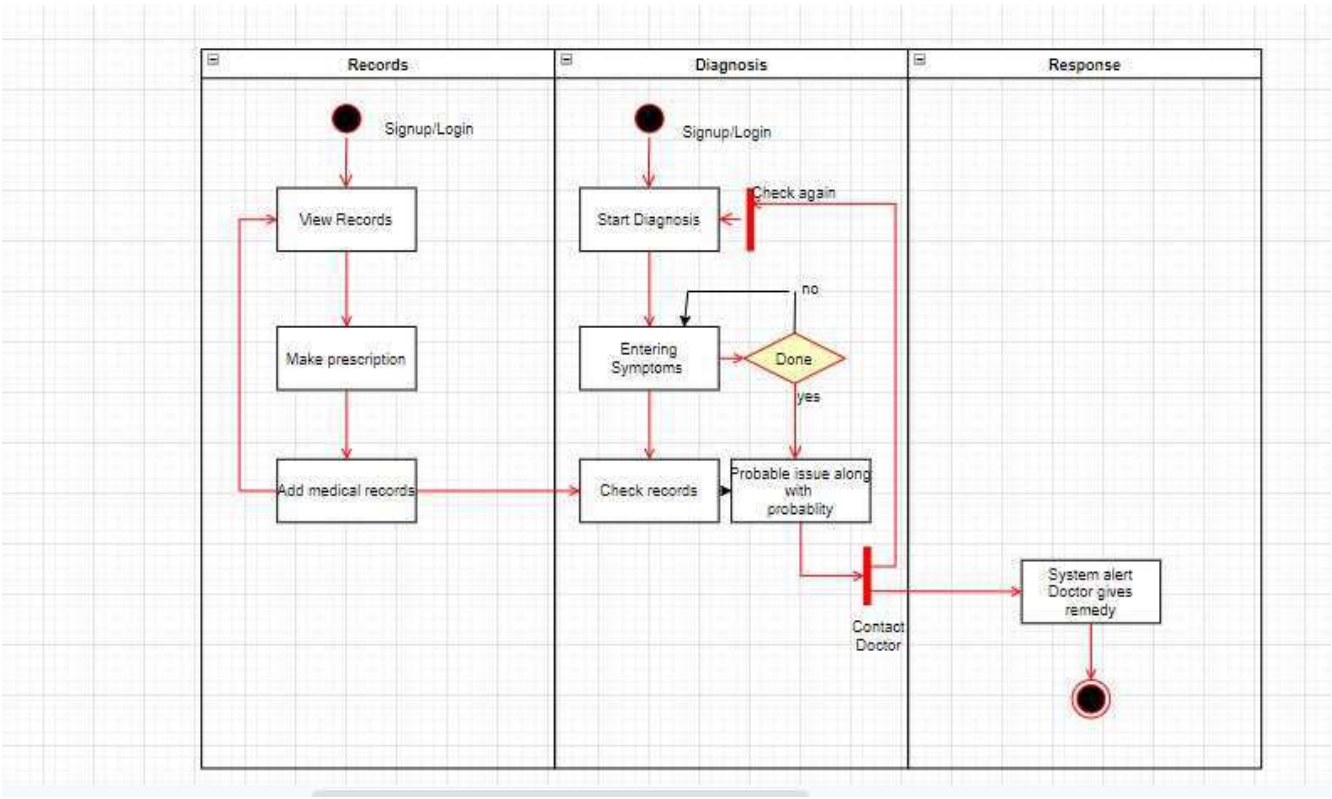
(a)Entity Relationship



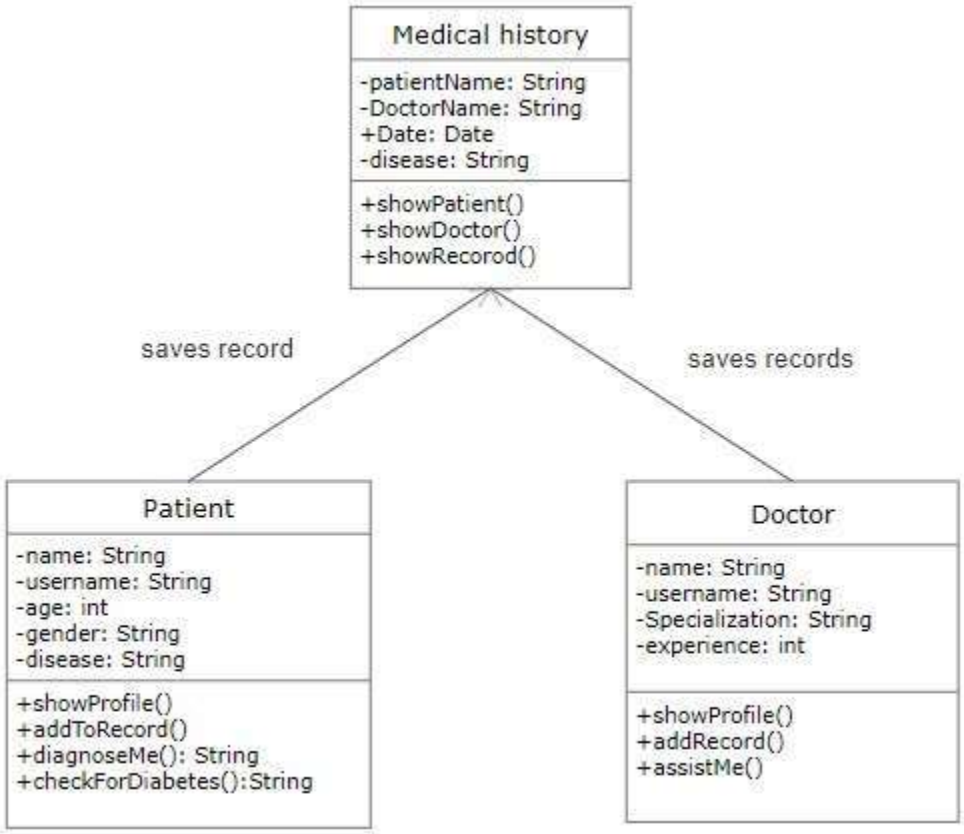
(b)State Transition Diagram



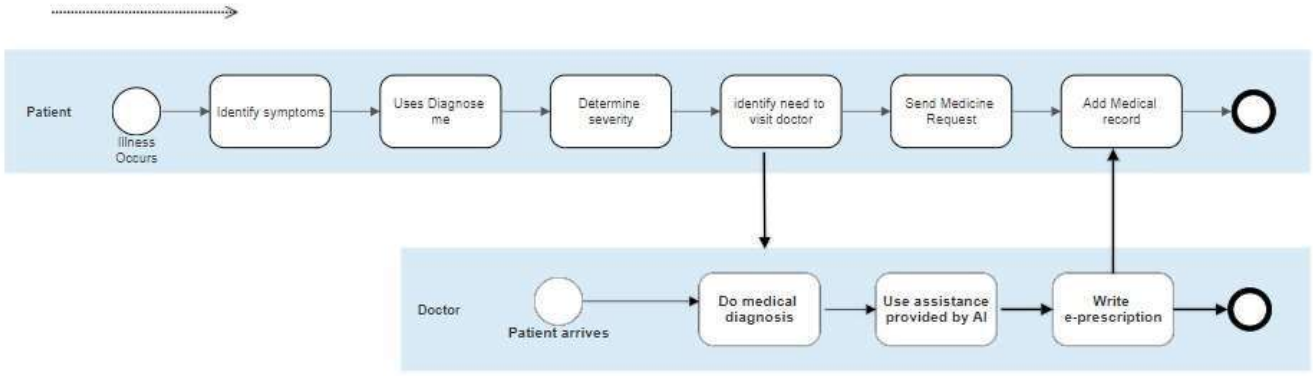
(c)Sequence Diagram



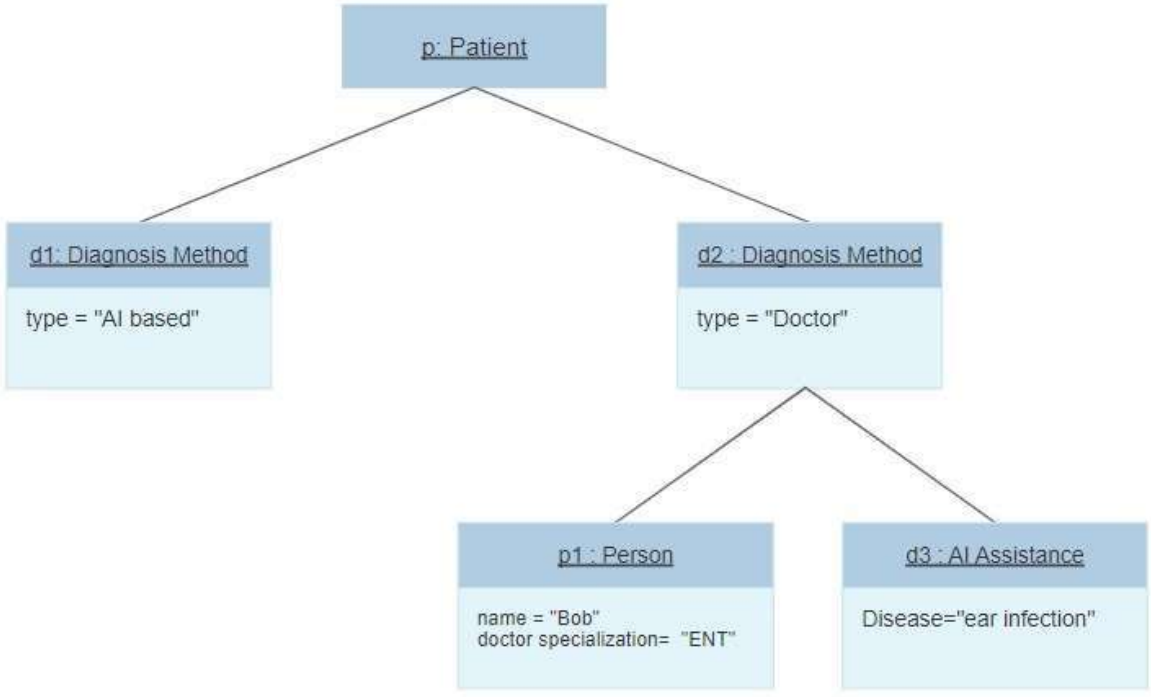
(d) Activity Diagram



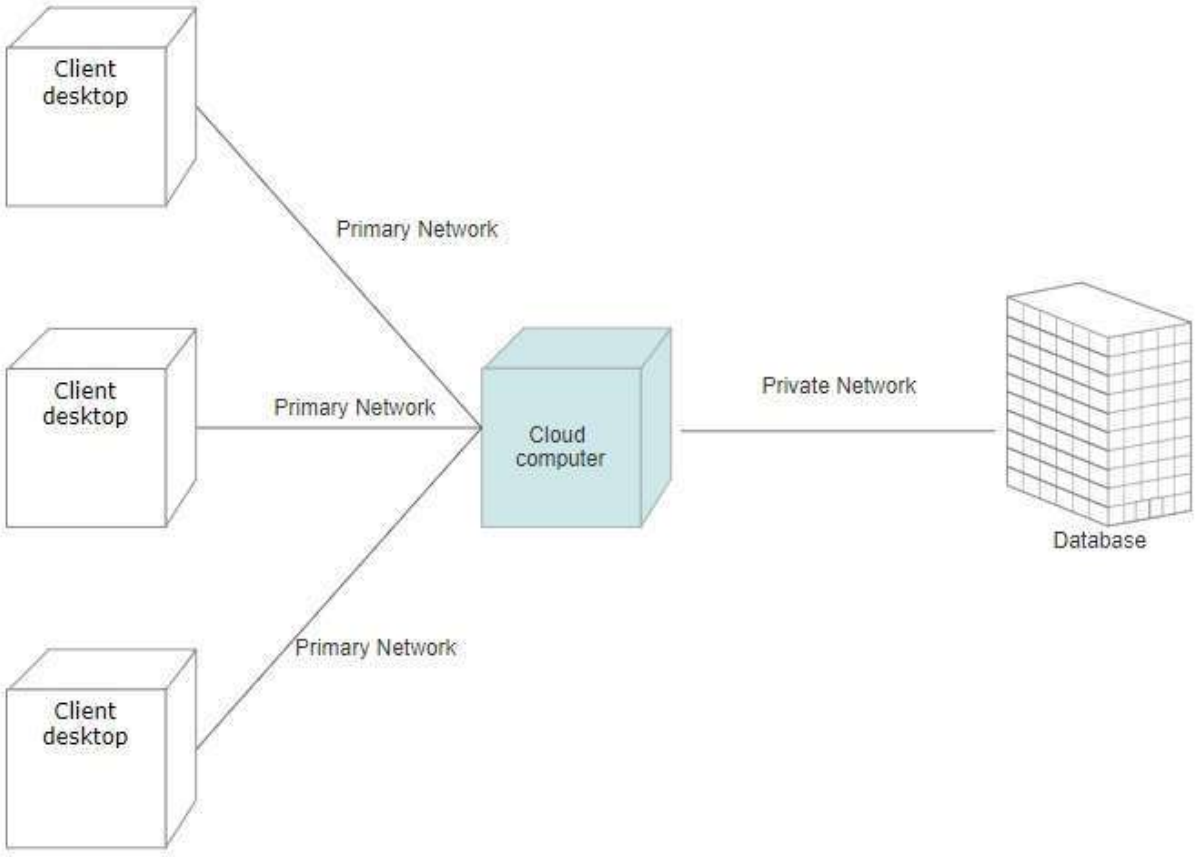
(e) Class Diagram



(f) Collaboration Diagram

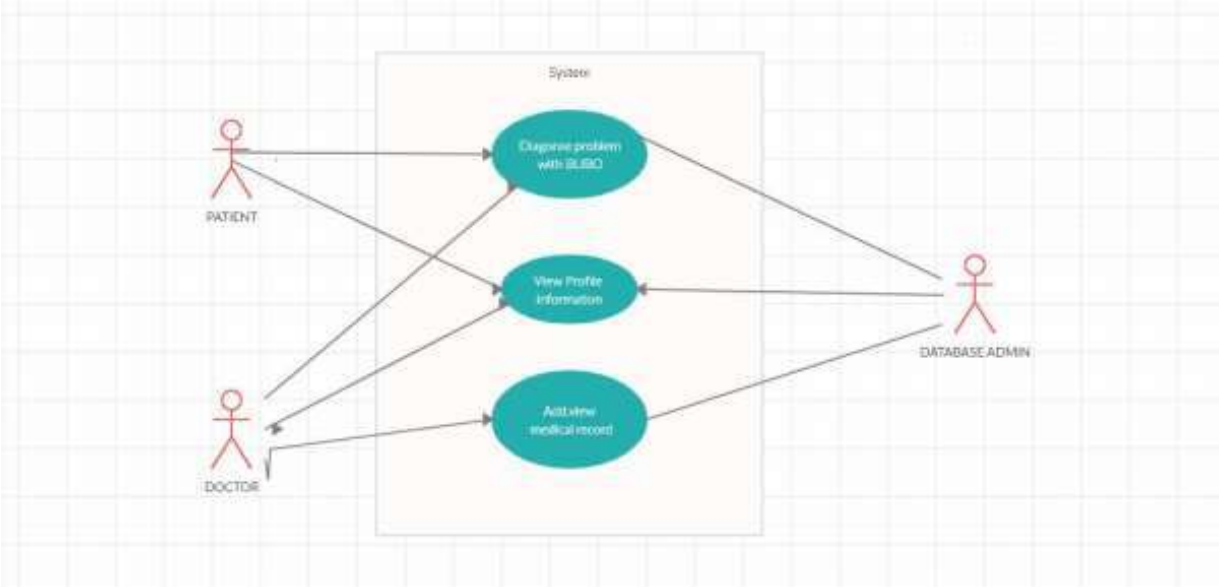


(g) Object Diagram



(h) Deployment Diagram

2.1 Use case Model



- Patient logs in his account.

• Patient views his medical records sorted the way he wants.
• Patient views one particular medical record with its prescription.
• Patient use the voice assistant to diagnose his illness with a confidence score.
• Patient gets graphical analysis of his predicted diseases with probabilities of each disease.

• Patient goes to the doctor.
• Doctor analysis the symptoms and can use the AI based assistance to his aid for diagnosis of disease.
• Doctor can view the patient previous medical history to prescribe new medication.
• Doctor use the voice assistant to write down prescription with his or her voice.
• These prescriptions will be stored in the database.
• Patient can order a particular medicine using automation provided by our medical assistant from online medical stores like NetMeds.
• Patient logs out from the system.

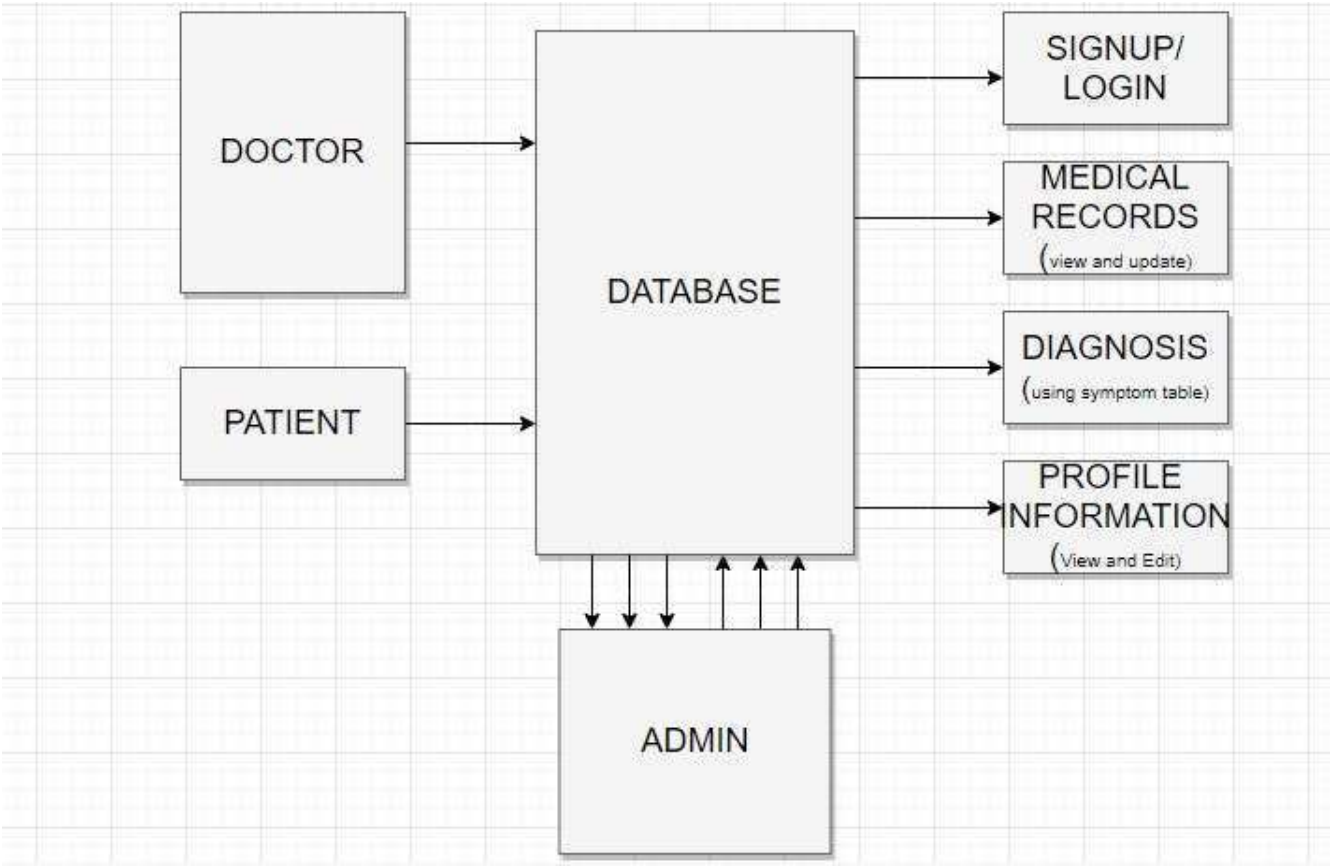
3. SOFTWARE DESIGN DOCUMENT

The scope for this project includes everything medical practice field needs to replace their current system with our system in addition to a couple of extra features. The scope primarily consists of three parts, the database, the Doctor's interface and the Patient Interface. The three of those parts each have a distinct scope.

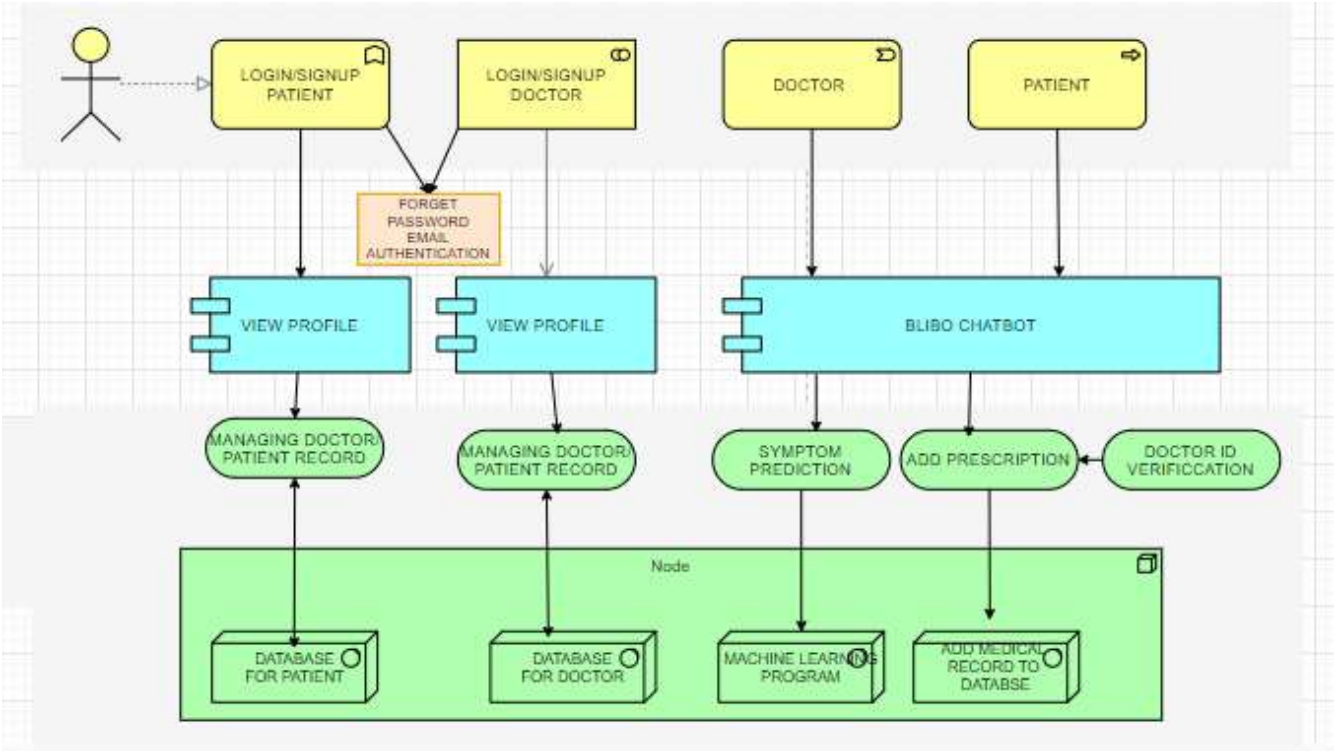
The database must be accessible only to doctor's for viewing purposes. A huge part of this involves scanning and storing documents on a per patient basis. Each document may have different pieces of data that need to be tracked in the database. The database will be in charge of keeping track of what pieces of data each document is associated with as well as storing each instance of that data that has been input. Additionally, the database will be stored using the blockchain technology in order to ensure data security from thefts.

The Doctor's Interface is as follows. There will be an application connected to the hospital server to access the database. A chatbot helps doctor write a prescription and helps him to identify what issue the patient might be facing based on the issue, the symptoms and related diseases are stored as a separate table in the database.

The Patient interface is the primary Interface, and the patient can login to identify what issue he might be facing in case he is unable to have medical access, which yields result based on the symptoms he enters along with their probability of occurrence. Additionally, the system transmits the data to the doctor in a scenario where the issue is serious.



3.2 Proposed Architecture /Framework



This is the basic framework of our Web Application “CARDINATION”, which provides medical care access in a safe, secure, interactive and easy way.

In our architecture diagram, we see 4 different modules coming together to form an application for doctors and patients. We manage two databases for doctor and patient as they have different fields that provide authentication. Login/Signup module and Edit Profile Module are based on Set/Update and Creation of new records in database that manages records.
The symptom prediction module requires a machine learning code that contains all the possible symptoms related to common problems that are frequently misdiagnosed in self diagnosis. We also predict probability of the prediction on the basis of number of symptoms matched and number of diseases with similar symptoms.

A doctor can add prescription for a patient after entering his unique identification. This prescription is stored I the patient record as its medical history. A patient can directly access online medical store "https://www.netmeds.com/" to get medicine.

And most importantly, this entire application can be run via our interactive Chatbot "BLIBO" which interacts with patient and doctor to help write prescription, check symptoms and edit profile hands free.

FORGET PASSWORD FRAMEWORK:

4. IMPLEMENTATION

4.1 Implementation Diagram

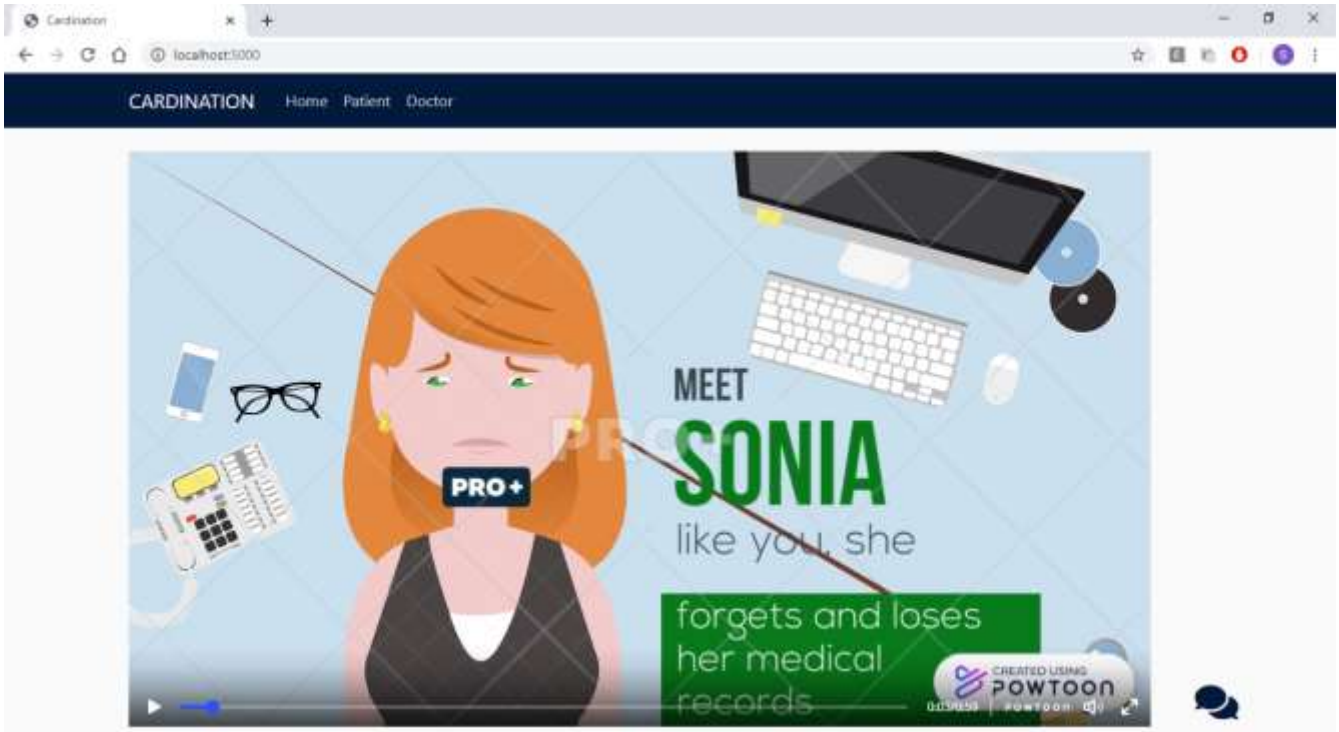
We have implemented this system using Flask back-end framework. We used flask as it uses python as programming language. It is a microframework which allowed our system to be modular in design. Modularity ensures better and more manageable workflow and maintenance.

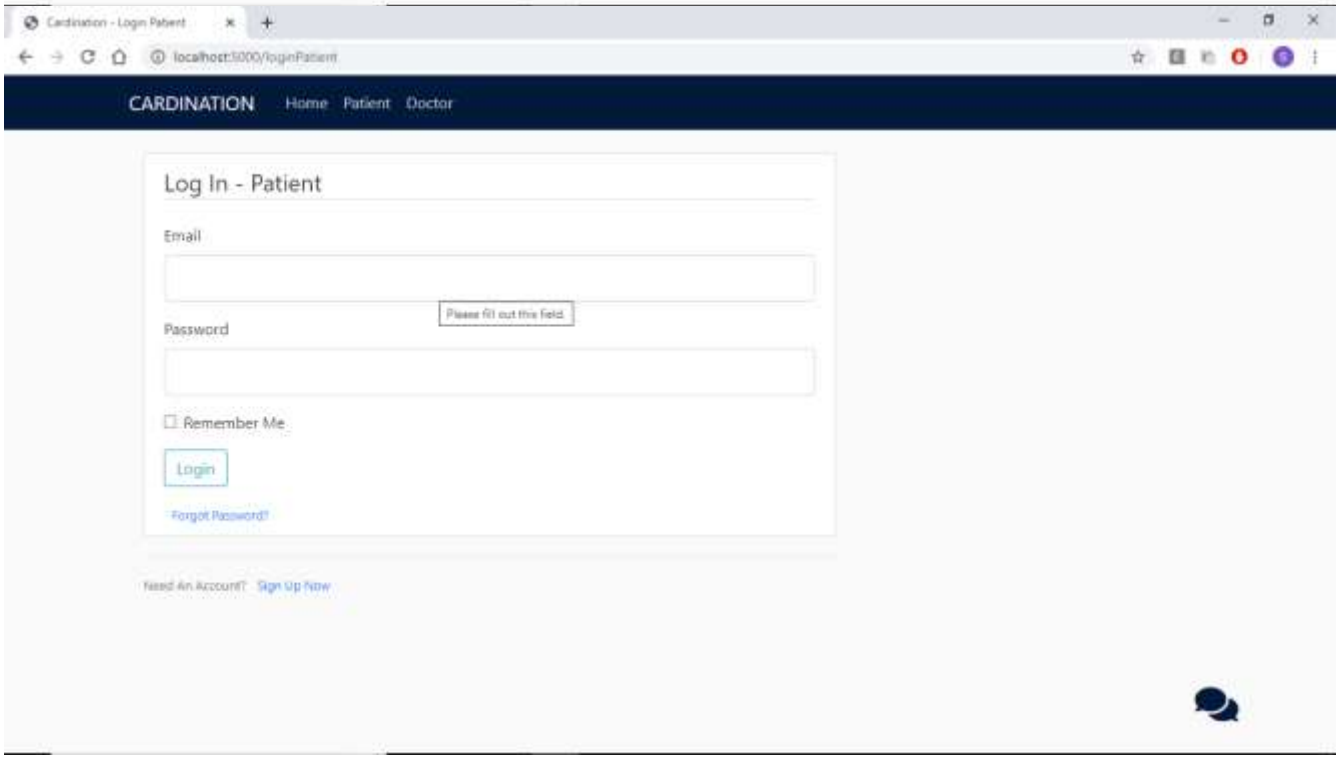
This system expects two kinds of users. A user can either be a patient or a doctor. So, we constructed a database system using ORM name Flask SQLAlchemy. This ORM is used a for create database which is SQL lite for now. We have two tables for patient and doctor which stores all the information regarding them. Another table named records is being used to store records for patients.

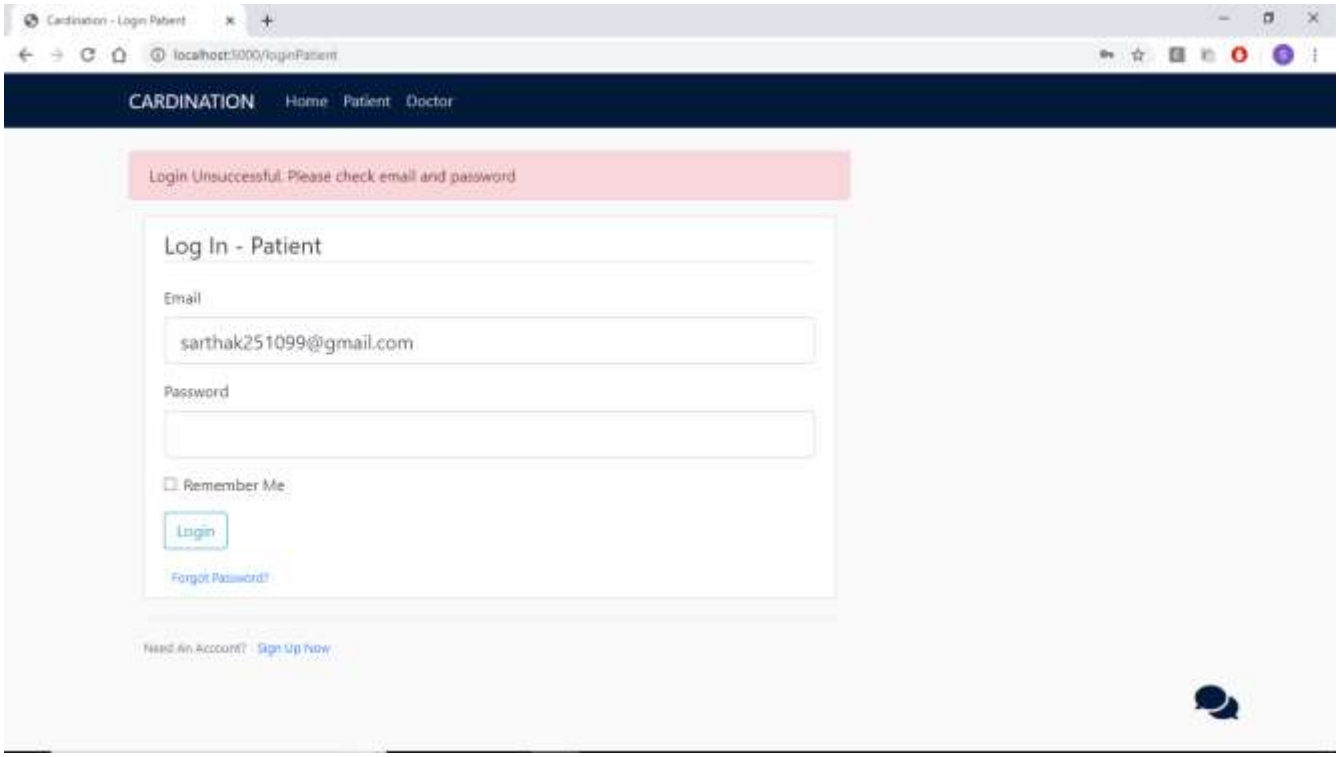
Account for user is created in Sign-up page. Here details like email and password are taken from the user. Password is hashed and stored in database to ensure it is stored safely.

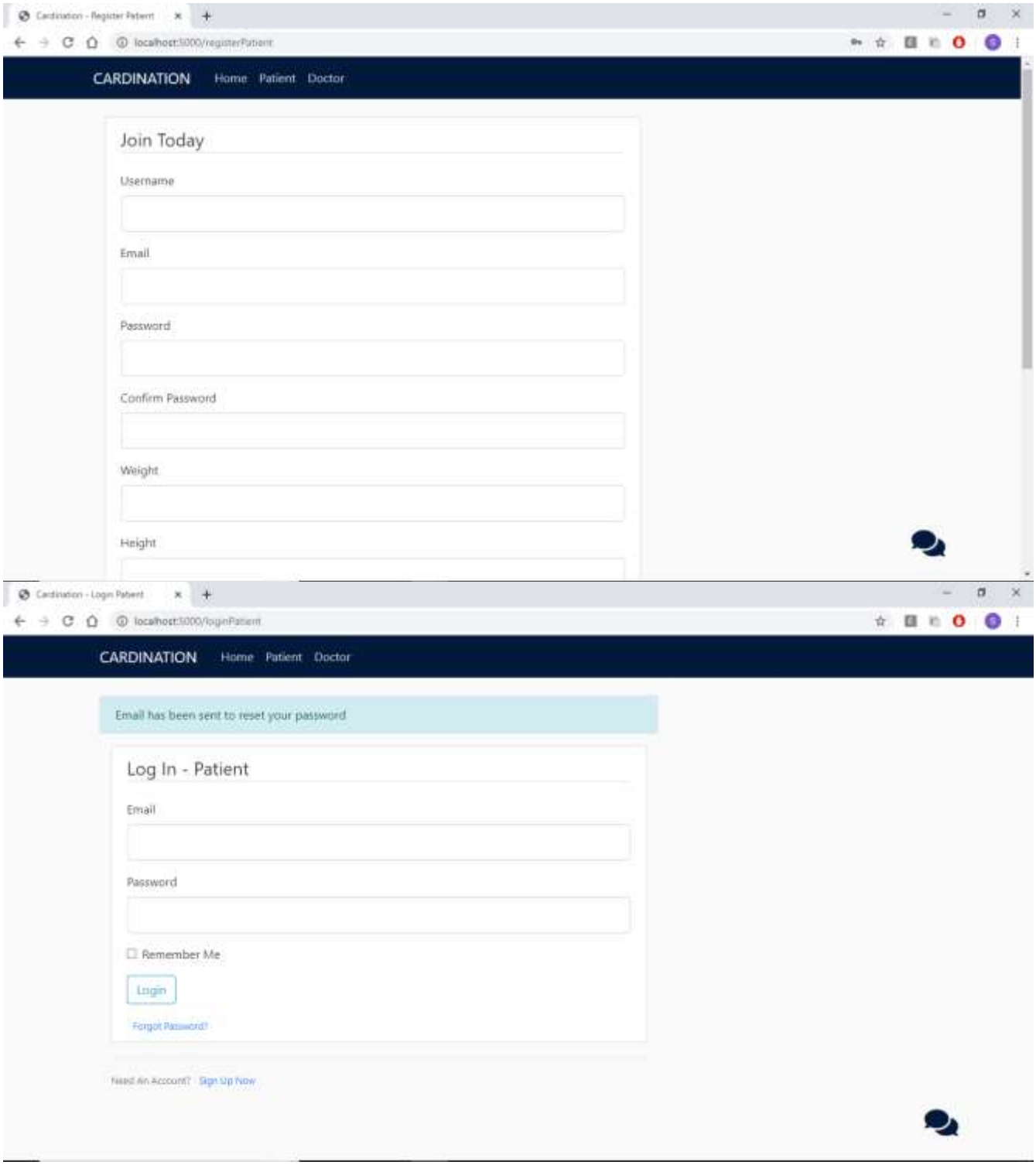
Authentication system is managed by a Flask package called Flask-Login. User has to give email password to verify his identity. The password is converted in hash and matched with the hashed password stored in database.

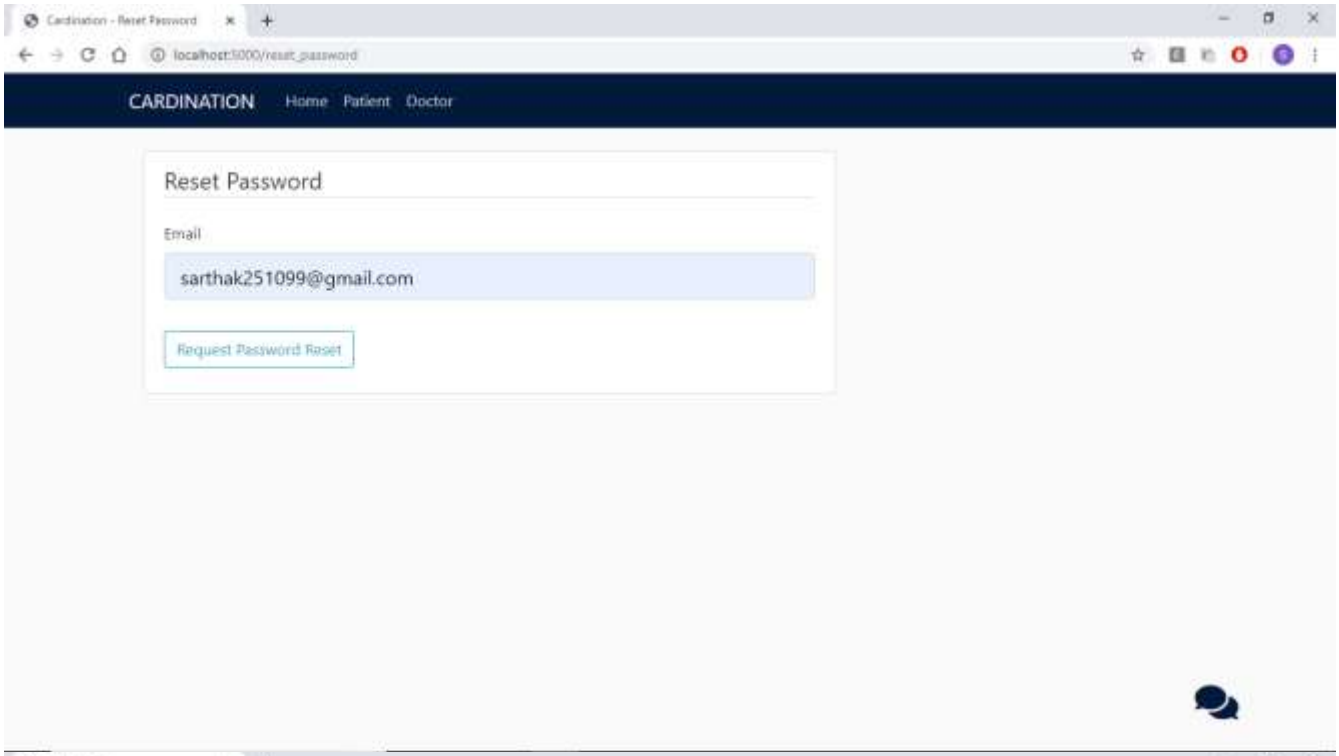
Selenium is used for automations. RandomForestClassifier is used for disease prediction.

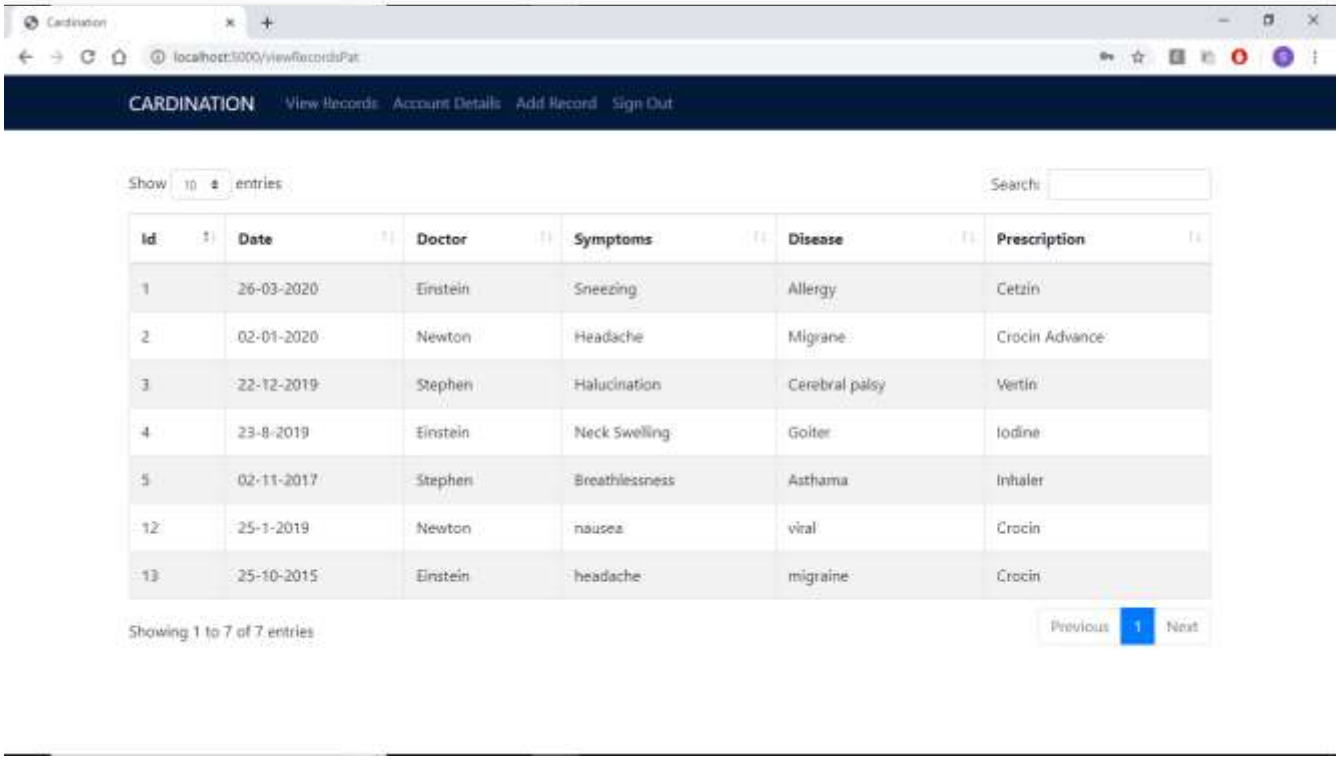





Cardination - Login Patient
localhost:5000/loginPatient
CARDINATION
Home
Patient
Doctor
Login Unsuccessful. Please check email and password
Log In - Patient
Email
sarthak251099@gmail.com
Password
Remember Me
Login
Forgot Password?
Need An Account? Sign Up Now


Cardination - Register Patient
localhost:5000/registerPatient
CARDINATION
Home
Patient
Doctor
Join Today
Username
Email
Password
Confirm Password
Weight
Height
Cardination - Login Patient
localhost:5000/loginPatient
CARDINATION
Home
Patient
Doctor
Email has been sent to reset your password
Log In - Patient
Email
Password
Remember Me
Login
Forgot Password?
Need An Account? Sign Up Now





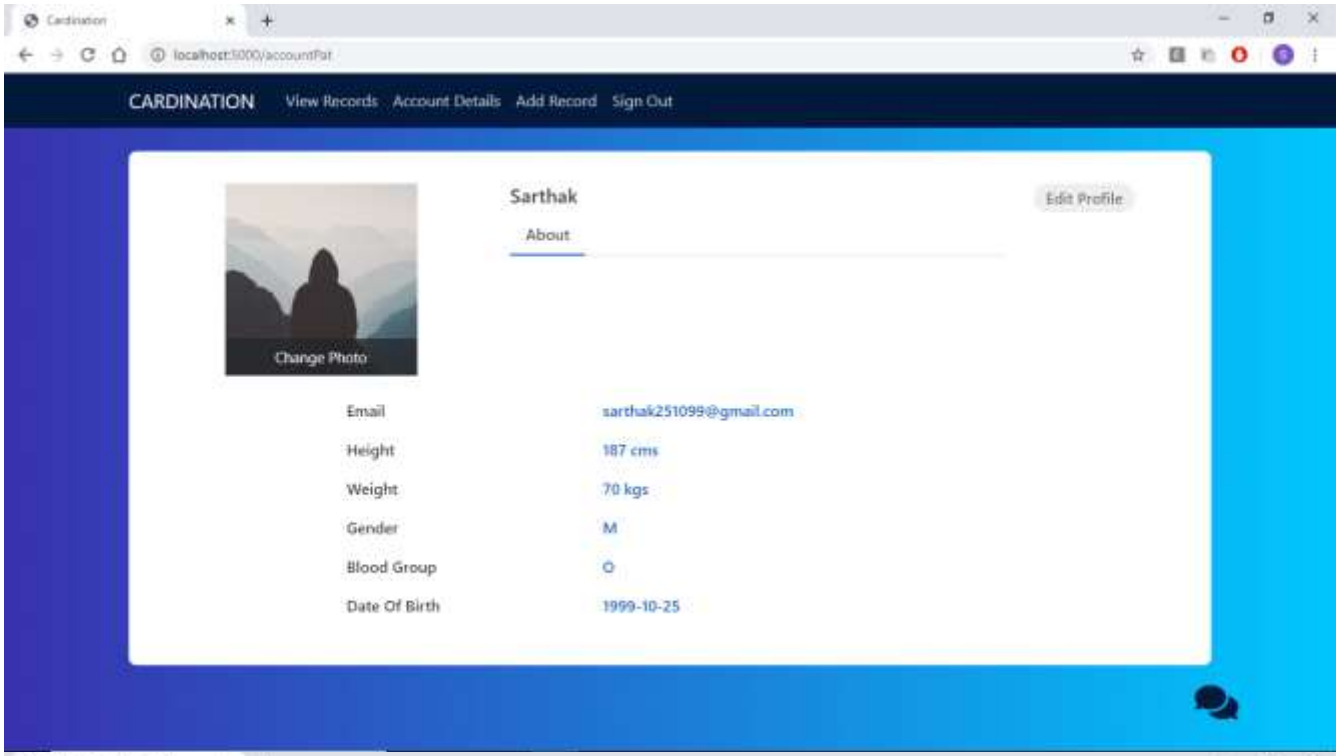
Show 10 entries

Search:

Id	Date	Doctor	Symptoms	Disease	Prescription
1	26-03-2020	Einstein	Sneezing	Allergy	Cetzin
2	02-01-2020	Newton	Headache	Migrane	Crocin Advance
3	22-12-2019	Stephen	Halucination	Cerebral palsy	Vertin
4	23-8-2019	Einstein	Neck Swelling	Goiter	Iodine
5	02-11-2017	Stephen	Breathlessness	Asthama	Inhaler
12	25-1-2019	Newton	nausea	viral	Crocin
13	25-10-2015	Einstein	headache	migraine	Crocin

Showing 1 to 7 of 7 entries

Previous 1 Next


CARDINATION
View Records
Account Details
Add Record
Sign Out
Sarthak
Edit Profile
About
Change Photo
Email
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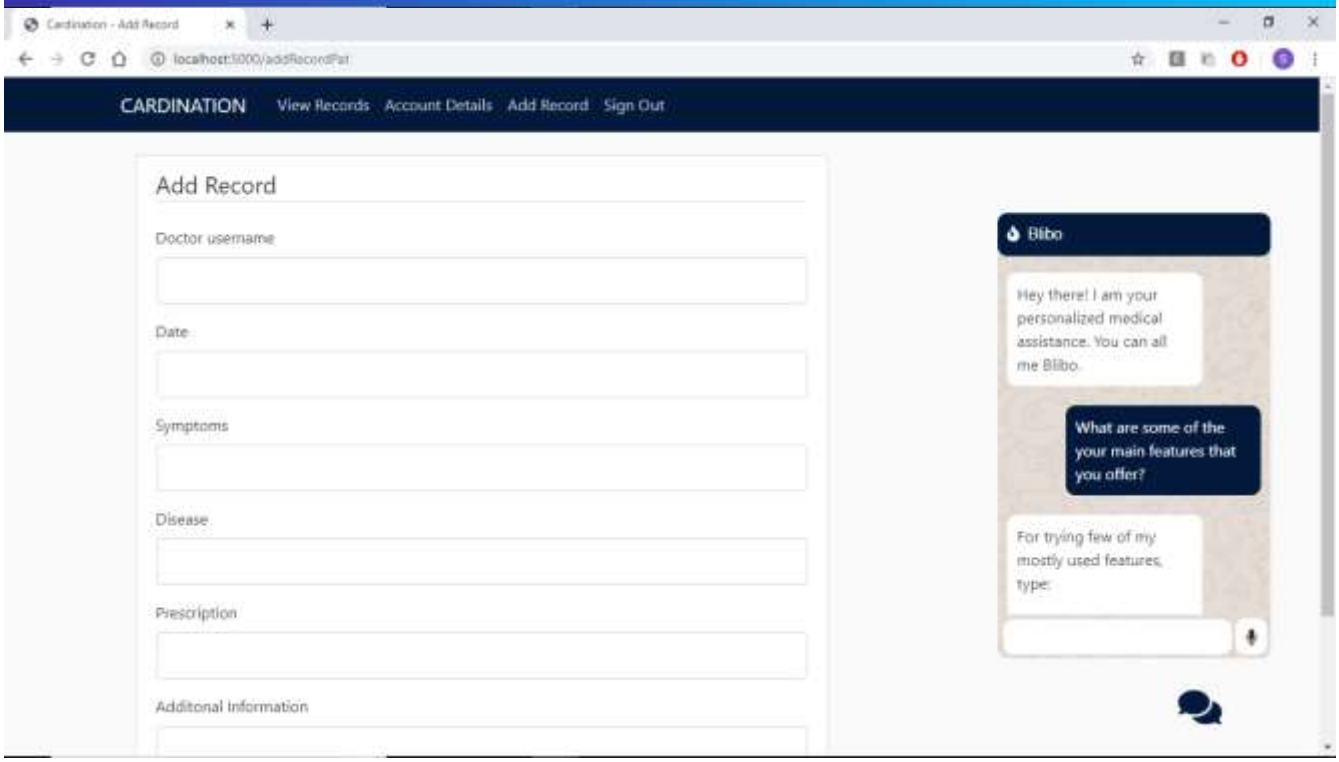
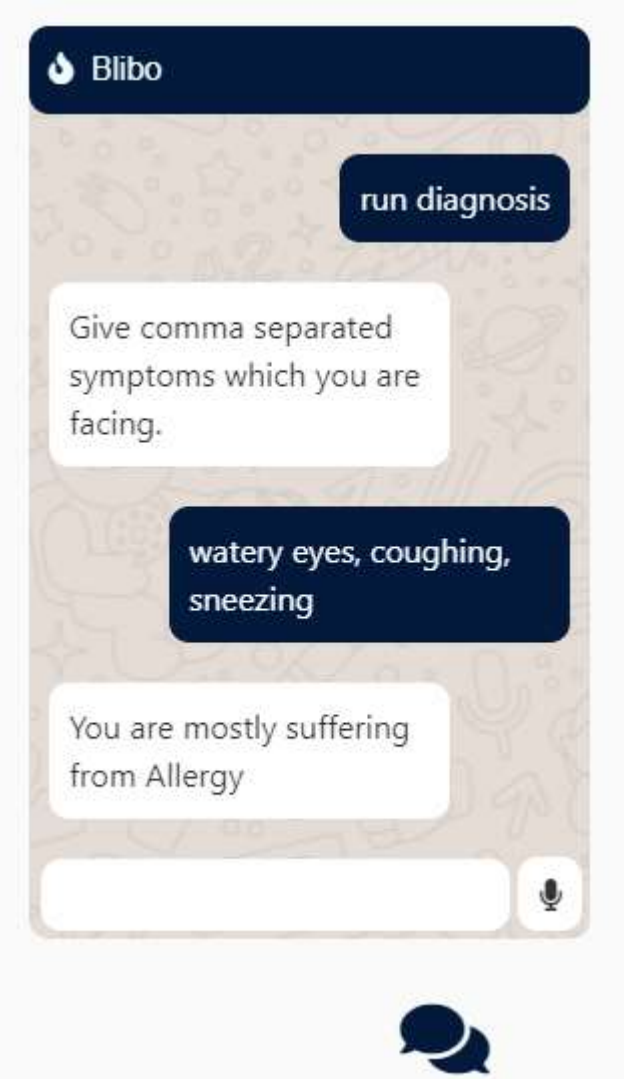
Height
187 cms
Weight
70 kgs
Gender
M
Blood Group
O
Date Of Birth
1999-10-25


CARDINATION
View Records
Account Details
Add Record
Sign Out
Add Record
Doctor username
Date
Symptoms
Disease
Prescription
Additonal Information
Bibo
Hey there! I am your personalized medical assistance. You can all me Bibo
What are some of the your main features that you offer?
For trying few of my mostly used features, type:



5. CONCLUSION

In this application, we develop a platform to facilitate doctors with their jobs of identifying patient issues and patient to self-diagnose itself in case of emergency. We bring automation and digitalization to medical care through concepts like machine learning, DBMS, AI and NLP.

This application is exclusively made to assist doctors and patient with intention of giving medical care in an interactive, life saving and resource saving manner. This application is a minor step in achieving a bigger target of completely digitalizing our medical care. A lot more work can be done to further improve our initiative in this regard such as video conferencing between patient and doctor, so that our doctors are one click away from us. We can improve our security substantially in terms of password protection and medication misuse. The world is digitalizing everything at a rapid pace, and the medical care sector, which has time and time proven to be the backbone of our lives, should not fall behind in this regard.

6. REFERENCES

[1] https://www.studentprojectguide.com/php/online-hospital-management-system/

[2] Bradley Malin (2010). Guidance on De-identification of Protected Health Information. Office for Civil Rights., U.S. Department of Health & Human Services.

[3] Garrido, T., Raymond, B., Jamieson, L., Liang, L., Wiesenthal, A., (2004). Making the business case for hospital information systems. Journal of Healthcare Finance, 31(2): 21–22.